HATCHERY EVALUATION REPORT

Methow Fish Hatchery - Spring Chinook (Twisp Stock)

January 1997

Integrated Hatchery Operations Team (IHOT)

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An Independent Audit Based on Integrated Hatchery Operations Team (IHOT) Performance Measures

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Section 1

Executive Summary

This report presents the findings of the independent audit of the Methow Fish Hatchery - Spring Chinook (Twisp Stock) program. The hatchery is located along the Methow River upstream from the confluence with the Chewuch River in north-central Washington, near the town of Winthrop. The hatchery is used for adult collection, incubation, and rearing of three spring chinook stocks.

The audit was conducted in 1996-1997 as part of a 2-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) "Strategy for Salmon" and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the Integrated Hatchery Operations Team (IHOT). IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination, (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995).* That document is the source for the performance measures that are the basis of this audit.

The Audit Process

The audit was based on the facility management's response to a 109-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters.
- The hatchery manager was asked to fill out and return the audit form.
- A 1-2 day site audit visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans.
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and IHOT representative.
- This hatchery evaluation report was written to document compliance with IHOT performance measures and develop cost estimates for remedial actions when needed.

Methow Fish Hatchery - Spring Chinook (Twisp Stock) Results

The Methow Fish Hatchery includes 12 rearing ponds, 24 starter troughs, 3 adult ponds and 3 lined acclimation and release ponds. The Methow Hatchery began operating in 1992 to mitigate for fish losses caused by the construction of the Wells Project. The hatchery uses well water for incubation and a combination of well water, Methow River water for fish rearing and river water for acclimation.

The Methow Fish Hatchery - Spring Chinook (Twisp Stock) program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery was not meeting its adult return goal. The audit found that the hatchery was not in compliance for water quality monitoring requirements and, for full program, would need 12 additional starter tanks, 5 more raceways, and 2 additional acclimation ponds. The hatchery needed to develop specific incubation standards for the IHOT Operations Plan, develop a smoltification goal and monitoring plan, and double screen the raceways. The hatchery was not following some of the IHOT protocols for feed preparation and transportation.

The specific areas in which the Methow Fish Hatchery - Spring Chinook (Twisp Stock) program requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Conduct IHOT QA/QC tests for feed preparation
- Develop specific incubation standards for IHOT Operations Plan
- Develop smoltification goals and monitor
- Follow IHOT disinfection protocols for tank interiors
- Follow IHOT protocols for disinfection of exteriors and interiors of transport vehicles
- Follow IHOT standards for monitoring of oxygen concentration during transport
- Improve adult returns
- Install double screens on raceways
- Install foot baths in incubation facilities
- Monitor DO and TGP
- Need 12 additional starter tanks, 5 more raceways, and 2 additional acclimation ponds for full program
- Review IHOT disease-free criteria for rearing and acclimation
- Review IHOT temperature criteria for rearing
- Run analysis for missing water chemistry parameters, nitrite, and contaminants

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery (Type 1 in Table 3, Section 4 of this report) were not listed above.

Section 2

Facility Description

Name: Methow Fish Hatchery

Stock/Species: Spring Chinook (Methow Stock)
Spring Chinook (Twisp Stock)
Spring Chinook (Chewuch Stock)

Operating Agency: Washington Department of Fish and Wildlife

Funding Agency: Douglas County PUD

Location: The hatchery is located along the Methow River upstream from the confluence with the Chewuch River in north-central Washington, near the town of Winthrop.

Address: Methow Fish Hatchery
Washington Department of Fish and Wildlife
440 Wolf Creek Road
Winthrop, WA 98862

Hatchery Manager: Mr. Bob Jateff

Phone: (509) 996-3114
Fax: (509) 996-2605

Purpose: The Methow Hatchery began operating in 1992 with the purpose of mitigating fish losses caused by the construction of the Wells Project. Douglas County PUD provides funding for this hatchery under the FERC Wells Dam Settlement Agreement (FERC Project No. 2149).

The goal of this hatchery is to increase the number of naturally spawning spring chinook salmon adults in the Methow, Twisp and Chewuch Rivers.

Production Goal:

Spring Chinook (Methow Stock)

Produce 246,000 yearling spring chinook smolts - Methow River

Spring Chinook (Twisp Stock)

Produce 246,000 yearling spring chinook smolts - Twisp River

Spring Chinook (Chewuch Stock)

Produce 246,000 yearling spring chinook smolts - Chewuch River

Water Supply: Water rights total 18 cfs for surface water from the Methow River (11 cfs full time and 7 cfs part time). Groundwater rights total 10 cfs from 4 wells. Well water is used for adult holding, incubation, and early rearing. Well water and surface water are used for final rearing and acclimation.

Facilities:

Adult Holding:	3 Covered concrete holding ponds, - 7,680 cf each
Incubation:	300 Isolation buckets
	45 Vertical stack Incubators (360 trays)
Early Rearing:	24 Fiberglass starter tanks - 112 cf each
Raceways:	12 Covered concrete raceways - 2,560 cf each
Rearing Ponds:	1 Lined rearing pond - 24,750 cf
Satellite Facilities:	Twisp pond
	1 Asphalt lined rearing pond - 22,000 cf
	Chewuch pond
	1 Asphalt lined rearing pond - 27,000 cf

Section 3

Compliance Status

The hatchery audits are based on compliance with written IHOT performance measures. These performance measures are documented in ***Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*** (referred to as *IHOT 1995* in this report).[1] The purpose of the performance measures is to implement new basinwide policies that provide regional guidelines for operating anadromous hatcheries in the Columbia Basin.

The audit focuses on performance measures for IHOT policies that cover (1) hatchery performance standards, (2) fish health, (3) ecological interaction, and (4) genetics. These performance measures are intended to guide hatchery operations once production is established. For that reason, the hatchery operations audit included broodstock collection, spawning, incubation of eggs, fish rearing and feeding, fish release, equipment maintenance and operations, and personnel training. Production priorities are beyond the scope of this audit.

Based on *IHOT 1995*, a detailed 109-page audit form was developed. The audit form divided the performance measures into six major sections along major program and technical criteria areas. Two additional sections (sections 1 and 8) include general information and expenditure information needed for this Hatchery Evaluation Report and blank forms for additional comments. The following is the basic structure of the IHOT audit form:

Section 1	Performance Measures for General Information and Expenditure Information (PMs General 1-2)
Section 2	Performance Measures for Program Objectives (PMs 1-4)
Section 3	Performance Measures for Facility Requirements (PMs 5-15)
Section 4	Performance Measures for Hatchery Practices (PMs 16-25)
Section 5	Performance Measures for Fish Health Policy (PMs 26-34)
Section 6	Performance Measures for Ecological Interactions (PMs 35-38)
Section 7	Performance Measures for Genetics Policy (PMs 39-43)
Section 8	Blank Forms for Additional Comments

Several performance measures are repeated in various sections of the audit form. These performance measures overlap in *IHOT 1995* and were retained to allow individuals interested in specific portions of the audit (such as Genetics or Fish Health) to determine the compliance status of all performance measures for a given topic in one location. A repeated performance measure is indicated by shaded text.

The Hatchery Audit Process

The hatchery audit will be conducted over a 2-year period that concludes in 1997. At each hatchery, a five-step process was used to complete the overall hatchery audit.

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[1]Integrated Hatchery Operations Team (IHOT) 1995. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*, Bonneville Power Administration, Portland, Oregon.

This process consisted of research and onsite visits. The site visit at the Methow Fish Hatchery was conducted on October 21-22, 1996.

The following is the five-step audit process:

1. Information was obtained from headquarters.

2. The hatchery manager was asked to fill out and return the **Audit Form**.

3. A 1-2 day site audit visit was conducted at each hatchery. During that visit an audit team inspected facilities, reviewed hatchery records, discussed audit form responses, and developed remedial action plans when appropriate.

4. During the site visit, the compliance status of each performance measure was discussed with the hatchery manager and IHOT representative. A portion of the Hatchery Evaluation Report was sent to the hatchery manager following the audit visit as a **Compliance Report**. That Compliance Report is Table 2 of this report.

5. Information from steps 1-4 was used to prepare a draft **Hatchery Evaluation Report**. This draft report was submitted to the operating agencies for review of the information used to determine compliance. Based on review and comments, a final Hatchery Evaluation Report was developed. The final report documents the compliance of a particular hatchery with the IHOT performance measures and presents cost estimates to correct any deficiencies.

Compliance Status of Methow Fish Hatchery - Spring Chinook (Twisp Stock)

The following table includes information on life-stages that are held on this facility for some portion of their rearing cycle (Table 1). For multi-facility programs, summary cost and contribution data is presented at the facility where rearing occurs. For the compliance status relating to performance measures that do not occur at this hatchery, please refer to the Hatchery Evaluation Reports for the hatcheries and stocks listed in Table 1. A check mark (✔) indicates that the specific life-stage is held at this facility.

This section documents the compliance status of the Methow Fish Hatchery - Spring Chinook (Twisp Stock) program. Each performance measure is presented in a table taken from the audit form (Table 2). The compliance status is identified by the following categories:

- **N/A** (not applicable)
- **Yes** (in compliance)
- **?** (unknown; generally due to unavailability of information to determine compliance)
- **No** (not in compliance).

Remedial actions are suggested for performance measures not in compliance. These remedial actions are grouped into categories and listed in Section 4 of this report, where the cost of the required remedial actions is also presented.

Table 1 Summary Program Information for Methow Fish Hatchery - Spring Chinook (Twisp Stock)

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Twisp Weir	Methow Fish Hatchery	Twisp Acclimation Pond			
Adult Collection	✔					
Adult Holding		✔				
Spawning		✔				
Fertilization		✔				
Incubation						
green-to-eyed		✔				
eyed-to-hatch		✔				
Rearing						
fry		✔				
fingerlings		✔				
smolts		✔				
Acclimation/release			✔			

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
the hatchery programs outlined in a subbasin nagement plan?		✔			Columbia Basin System Planning Production Plan Methow Basin Spring Chinook Plan and the Wells Dam Settlement Agreement	
ne hatchery operating under a current hatchery rational plan? s it understood by staff? s it being followed?		✔ ✔ ✔			IHOT Operations Plan and Methow Hatchery O&M Manual	
hatchery monitoring and evaluation plan in place? Do you have a written monitoring and evaluation plan?		✔			M&E program described in the Wells Dam Settlement Agreement	
ult contribution to fisheries, spawning grounds, and chery			✔		Limited data available; first releases in 1992	
ult pre-spawning survival as compared with blished goal		✔			Review of records; in compliance 3 out of last 3 years	
-take as compared with established hatchery goal				✔	Review of records; in compliance 0 out of last 4 years	Improve adult returns
en-egg to eyed-egg survival as compared with blished goal		✔			Review of records; in compliance 3 out of last 3 years	
d-egg to fry survival as compared with established l		✔			Review of records; in compliance 3 out of last 3 years	
to smolt survival as compared with established goal		✔			Review of records; in compliance 2 out of last 2 years	
duction as compared with established goal				✔	Review of records; in compliance 0 out of last 3 years	Improve adult returns
cent survival (smolt to adult) as compared with blished goal			✔		Review of records; data incomplete. BY92 is the first group of returns.	Document smolt to adult survival
nber of eggs, fry, fingerlings, smolts, and/or adults neet basinwide needs	✔				Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nperature						
Does your water temperature meet the criteria for spawning?		✔			Review of records/Discussion	
Does your water temperature meet the criteria for ncubation?		✔			Review of records/Discussion	
Does your water temperature meet the criteria for earing?				✔	Hatchery Operating Plan is based on the use of natural water temperatures. Cooler in winter and warmer prior to release.	Review IHOT temperature criteria for rearing
solved gases						
s the oxygen level near saturation?			✔		No Data	Monitor DO
s the dissolved nitrogen level less than saturation?			✔		No Data	Monitor TGP
emistry						
mmonia (un-ionized)			✔		No Data	Run analysis
arbon Dioxide			✔		No Data	Run analysis
hlorine			✔		No Data	Run analysis
H		✔			Review of records/Discussion	
opper		✔			Review of records/Discussion	
ydrogen Sulfide			✔		No Data	Run analysis
on			✔		No Data	Run analysis
inc				✔	Zinc concentration found to be 0.03 mg/L as compared to 0.005 mg/L IHOT criteria. Hatchery has seen no problems	Review IHOT criteria for zinc
bidity						
Does your turbidity meet the criteria?		✔			Most water is well water. Surface water is from snow melt	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
alinity and hardness						
oes your alkalinity and hardness meet the criteria?		✔			Data provided	
ite						
oes your nitrite meet the criteria?			✔		No Data	Run Analysis
ontaminants						
ldrin			✔		No Data	
ndrin			✔		No Data	Run Analysis
ieldrin			✔		No Data	Run Analysis
eptachlor			✔		No Data	Run Analysis
hlordane			✔		No Data	Run Analysis
ethoxychlor			✔		No Data	Run Analysis
indane			✔		No Data	Run Analysis
alathion			✔		No Data	Run Analysis
uthion			✔		No Data	Run Analysis
hogens						
hat portions of the hatchery have disease-free water?						
Adult holding		✔			Well Water	
Incubation		✔			Well Water	
Early rearing		✔			Well Water	
Rearing				✔	Hatchery uses river water by preference for natural temperature patter ns. Can use well water	Review IHOT criteria and hatchery plan to determine appropriate water source for rearing and acclimation
Others				✔	See above	See above

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
rm Systems						
)o the following areas have alarms?						
Intake		✔			Inspection of facilities/Discussion	
Large rearing ponds and adult holding ponds		✔			Inspection of facilities/Discussion	
Raceway headboxes and rearing ponds		✔			Inspection of facilities/Discussion	
Incubation facilities		✔			Inspection of facilities/Discussion	
Quarantine areas and facilities		✔			Inspection of facilities/Discussion	
Water treatment systems		✔			Inspection of facilities/Discussion	
Security		✔			Inspection of facilities/Discussion	
ıre there outside systems and buzzers in onsite esidences?		✔			Discussion	
ıre water flow alarms checked daily?		✔			Review of records/Discussion	
ıre all other alarms checked weekly?		✔			Discussion	
; there a log of alarms for emergencies, tests, and ıaintenance requirements?		✔			Review of records/Discussion	
ıre telephone pagers used?		✔			Discussion	
ılt collection and holding facilities						
)o you meet the adult holding criteria?		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıbation facilities						
'ype 1: Isolation Buckets)o you have an adequate number of units for the verall program?		✔			Inspection of facilities/Discussion	
'ype 2: Vertical Trays)o you have an adequate number of units for the verall program?		✔			Inspection of facilities/Discussion	
ıring facilities						
'ype 1: Start Tanks (in Bldg))o you have an adequate number of units for the verall program?				✔	Need for flexibility of handling different lots of fish. Not a problem until program nears goal production	Need 12 more starter tanks for full program. May be difficult in existing building
'ype 2: Raceways)o you have an adequate number of units for the verall program?				✔	Current system is too small to meet current DI criteria for full program	Several more raceways would be required to meet full program
'ype 3: Acclimation Pond)o you have an adequate number of units for the verall program?		✔			Inspection of facilities/Discussion	
eening facilities						
)o you meet the approach velocity criteria?		✔			Inspection of facilities/Discussion	
ıre the fish screens regularly cleaned?		✔			Inspection of facilities/Discussion	
)oes the screen mesh meet screen opening criteria?		✔			Inspection of facilities/Discussion	
ıre rearing containers double screened for fish that hould not be released to adjacent water?				✔	Inspection of facilities/Discussion	Install double screens in raceways
dator control facilities						
ıre your predation control facilities effective?		✔			Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
d storage facilities and quality control						
)oes the storage of dry/semi-moist/moist foods dry<12%; semi-moist 12-20%; moist >20% moisture) ollow food manufacturer's recommendations?		✔			Provided example and discussion.	
)oes a regional quality control officer oversee roduction procedures and monitor:						
Verification by feed manufacturer that ingredients meet specifications?				✔	Discussion	Conduct IHOT QA/QC for feed preparation
Ensure feed does not contain unwanted drugs or other additives?				✔	Discussion	See above
Analyze ingredients contained in the final food product to ensure that feed specifications have been met?				✔	Discussion	See above
ıre the foods stored and handled according to the ollowing criteria?						
Moist pellets should not exceed 10 °F at point of delivery.		✔			Discussion	
Moist pellets should be removed from freezer just prior to feeding.		✔			Discussion	
Do not leave buckets of feed or feed containers outside exposed to light or heat.		✔			Discussion	
Open bags of feed should be fed within 1 to 2 days except when feeding small groups of fish.		✔			Discussion	
Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80°F and above).	✔					

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ease facilities						
)o the release facilities ensure that fish are not ubjected to adverse conditions?		✔			Inspection of facilities/Discussion	
lution abatement facilities						
)o the pollution abatement facilities meet all federal nd state regulations (or good engineering practice)?		✔			Inspection of facilities/Discussion	
ıre pollution abatement facilities operated correctly?		✔			The facilities provided are operated correctly. They need a larger pump to draw pond waste from pond to the clarifier	
nsportation facilities						
ıre the transport systems adequate to meet IHOT erformance measures for transportation practices?		✔			Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
odstock selection practices						
s the donor selection process document attached? (PM 40a)		✔			New program.	
Was the donor selection outline followed in selecting ne hatchery broodstock? (PM #40b-c)		✔			See above	
wning practices						
Were the appropriate number of spawners, male/female atios, and fertilization protocols used? (PM #42c-g)		✔			Review of records/Discussion	
ıbation practices						
specific incubation standards listed in the hatchery rations plan?				✔	Review of IHOT Operations Plan and Hatchery Plan	Develop specific incubation standards (especially for isolation incubators) for the IHOT Operations Plan
incubation practices written?				✔	None supplied to inspection team	See above
ıbation Type 1: Isolation Buckets (see PM #8) you meet the loading and flow criteria?			✔		No criteria in Plan	See above
ıbation Type 2: Vertical Trays (see PM #8) you meet the loading and flow criteria?		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ring practices						
specific rearing standards listed in the hatchery rations plan?		✔			Review of IHOT Hatchery Operations Plan and Wells Dam Settlement Agreement	
rearing practices written?		✔			See Wells Dam Settlement Agreement	
earing Unit Type 1: Start Tanks (in Bldg) (see PM #9)						
Do you meet the density and DI criteria?		✔			Could use more starter tanks for better sorting	
Do you meet the Loading and FI criteria?		✔			Review of records/Discussion	
earing Unit Type 2: Raceways (see PM #9)						
Do you meet the density and DI criteria?		✔			Ok under current loads but they will exceed DI Criteria under full program. Construct additional raceways for full program.	
Do you meet the Loading and FI criteria?		✔			Review of records/Discussion	
earing Unit Type 3: Acclimation Pond (see PM #9)						
Do you meet the density and DI criteria?		✔			Review of records/Discussion. Construct additional acclimation ponds for full program.	
Do you meet the Loading and FI criteria?		✔			Review of records/Discussion	
olt quality						
Do you produce a high quality smolt?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
n health management practices						
re the monthly hatchery monitoring visits being onducted? (PM #26)		✔			Inspection of records/Discussion	
re the annual broodstock inspections being conducted? PM #27)		✔			Inspection of records/Discussion	
s there pathogen-free water and are the sanitation rocedures being followed? (PM #28)				✔	In compliance with the exception of the use of foot baths	See PM #28
re the following water quality parameters within riteria? (PM #5a-5g)						
Water temperature				✔	Non-compliance for rearing only	See PM #5a
Dissolved gases			✔		No Data	See PM #5b
Chemistry			✔		No Data	See PM #5c
Turbidity		✔			Review of records/Discussion	
Alkalinity and hardness		✔			Review of records/Discussion	
Nitrite			✔		No Data	See PM #5f
Contaminants			✔		No Data	See PM #5g
re rearing standards being followed? (PM #19)		✔			Not in compliance for rearing at full program	See PM #19
re egg and fish transfer/release requirements met? PM #31)		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s hatchery performance meet requirements lined in the regional hatchery policies and in basin and hatchery plans for the following areas?						
cent smoltification						
Do you measure percent smoltification?		✔			Discussion	
Do you have a smoltification goal?				✔	No established goal or criteria	Establish smoltification goal
Did you meet the smoltification criteria?			✔		See above	See above
ring density (prior to release)						
Did you meet the rearing density criteria just prior to elease?		✔			Density will be exceeded at full production. Review density criteria for this hatchery or build additional rearing and acclimation facilities.	
ease condition (at release)						
Did you meet all disease regulations just prior to elease?		✔			Review of records/Discussion	
nber (at release)						
Did you meet the release number goal?				✔	Data Provided	Improve adult returns
at release						
Did you meet the size goal?		✔			Review of records/Discussion	
es of release						
Did you meet the release date goal?		✔			Review of records/Discussion	
ation of release						
Did you release the fish at the specified location?		✔			Review of records/Discussion	
fish reared in the subbasin or acclimated in the basin?						
are the fish reared in the subbasin?		✔			Discussion	
are the fish acclimated in the subbasin?		✔			Discussion	
ne release strategy appropriate for the program?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nsportation facilities						
)o transportation equipment and personnel receive isinfection before and after use?		✔			Discussion	
; the fish tank interior disinfected using a solution of 00 ppm active chlorine for 30 minutes minimum or ɔrmaldehyde gas generation method (relative humidity f 60% for 2 hrs)?				✔	Use PVP Iodine Only	Follow IHOT disinfection protocols for tank interiors
; the exterior of the fish transport vehicle disinfected sing high pressure steam (115-130°C), high emperature acid, or with 200 ppm chlorine for 30 ıinutes?				✔	Discussion	Follow IHOT protocols for disinfection of exterior and interiors of transport vehicles
; the fish transport vehicle (cab) disinfected using 600 pm quaternary ammonia compounds (1.5 ml of 50% tock solution/liter water)?				✔	Discussion	See above
; other equipment disinfected including fish pumps, ets, egg sorters, waders, boots, rain gear, hoses and ther equipment using one of the following solutions?					Discussion	
200 ppm chlorine for 30 minutes 600 ppm quaternary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes		✔			Use iodophor	
)o personnel wear protective garments when handling sh eggs or cultural water?		✔			Discussion	
)o the fish transport truck/chassis and tank/unit receive n inspection and service prior to the release season?		✔			Discussion	
; a daily service inspection completed before starting p and leaving for the day?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nsportation facilities						
)oes the fish transport unit receive an inspection prior) loading?		✔			Discussion	
)oes a pre-loading inspection covering tank water evel, pumps or aerators, oxygen injection system ettings, displacement gauge, and truck loading/hauling ensity tables checked and reviewed occur prior to)ading fish in the transport unit?		✔			Discussion	
)o hauling criteria include checking the fish 45 minutes) 1 hour after loading?		✔			Discussion	
Vhen fish are active and systems are functioning roperly, is the oxygen concentration reduced and ıaintained at approximately 8 ppm?				✔	Check to see it is operating	Follow IHOT standards for monitoring of oxygen concentration during transport
; water temperature in the transportation unit ıaintained within the 42-48 °F range?		✔			Discussion	
)o fish releasing procedures include the following riteria?						
Releasing the fish at the correct release site or into the correct water body.		✔			Discussion	
Tempering or the difference between the liberation tank and the target water body should not exceed 10°F.		✔			Discussion	
The liberation hose should be angled so that fish gently hit the water. Using a tripod is a method of ensuring the hose will stay at the proper angle.		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
luation practices						
las the hatchery conducted fishery contribution studies):						
Determine the requirements for evaluating and improving management programs?		✔			Discussion	
Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?		✔			Discussion	
Develop guidelines that define if the proper stocks of fish are currently being used?		✔			Discussion	
Determine which management units contribute to a specific fishery and the time periods of those contributions?		✔			Discussion	
Determine the relative contributions of the various management units to a specific fishery over the different time periods?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ining practices						
Does the hatchery have a training schedule for its staff?		✔			Review of records/Discussion	
Does each staff member have a personal training plan approved by a supervisor and reviewed annually?		✔			Review of records/Discussion	
Does the hatchery routinely exchange training details between other hatcheries and agencies?		✔			Review of records/Discussion	
Does the hatchery encourage and reward off-duty training of staff?		✔			Review of records/Discussion	
Does the hatchery conduct monthly staff meetings?		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
monthly hatchery monitoring visits being ducted by a qualified fish health specialist as cribed below?						
Conduct visit at least monthly		✔			Review of records/Discussion	
Monitoring conducted by qualified fish health specialist		✔			Review of records/Discussion	
Examine a representative sample of healthy and moribund fish from each lot.		✔			Review of records/Discussion	
Review fish culture practices with hatchery manager.		✔			Review of records/Discussion	
Report finding and results of necropsies on standard form.		✔			Review of records/Discussion	
Recommend appropriate drug or chemical treatment.		✔			Review of records/Discussion	
Summarize fish health status or stock prior to release or transfer to another facility.		✔			Review of records/Discussion	
all of the functions of the hatchery yearly nitoring visits being completed as described below?						
Annually examine each broodstock for the presence of reportable viral pathogens.		✔			Review of records/Discussion	
Annually screen each salmon broodstock for the resence of *Renibacterium salmoninarum*.		✔			Review of records/Discussion	
Conduct inspection by or under the supervision of ualified fish health specialist.		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıe hatchery following accepted sanitation cedures?						
ıre there any sources of pathogen-free water, especially or incubation and early rearing?		✔			Discussion	
ıre the hatchery sanitation procedures understood and eing followed as described below?						
Disinfect/water harden eggs in iodophor?		✔			Inspection of facilities/Discussion	
Are foot baths containing disinfectant placed at the incubation facility's entrance and exit?				✔	Inspection of facilities/Discussion	Install foot baths
Is equipment and rain gear utilized in broodstock handling or spawning sanitized prior to its use elsewhere in the hatchery?		✔			Inspection of facilities/Discussion	
Is equipment used to collect dead fish sanitized prior its use in another pond and/or lot of fish?		✔			Inspection of facilities/Discussion	
Is equipment, including vehicles used to transfer fish between facilities, disinfected prior to use with any other fish lots or at any other location?		✔			Inspection of facilities/Discussion	
Are rearing vessels sanitized after fish are removed and prior to introducing a new fish lot or stock?		✔			Inspection of facilities/Discussion	
Are dead fish properly disposed of?		✔			Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
water quality parameters being followed?						
re the following water quality parameters within riteria? (PM #5a-5g)						
Water temperature				✔	Not in compliance with rearing criteria	See PM #5a
Dissolved gases			✔		No data	See PM #5b
Chemistry				✔	No data for many parameters	See PM #5c
Turbidity		✔			Review of records/Discussion	
Alkalinity and hardness		✔			Review of records/Discussion	See PM #5e
Nitrite			✔		No data	See PM #5f
Contaminants			✔		No data	See PM #5g
o to PM #21						
incubation and rearing standards being followed?						
Are the incubation practices following the IHOT incubation criteria? (PM #18)			✔		No IHOT criteria for bucket incubations	See PM #18
Are the rearing practices following the IHOT criteria? (PM #19)		✔			Meet criteria now but won't at full production	See PM #19
o to rearing practices PM #18-PM #19						
egg and fish transfer/release requirements met?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıe hatchery's program outlined in a subbasin ıagement plan? Go to subbasin plan PM #1		✔			Columbia Basin System Planning Production Plan Methow Basin Spring Chinook Plan and the Wells Dam Settlement Agreement	
ıe hatchery operating under a current hatchery rational plan? Go to operational plan PM #2		✔			IHOT Operations Plan and Methow Hatchery O&M Manual	
hatchery monitoring and evaluation plan in place? Go to hatchery monitoring and evaluation plan PM #3		✔			M&E program described in the Wells Dam Settlement Agreement	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the hatchery program meet requirements blished in the regional hatchery policies and basin planning documents in the following areas: cies, stock, broodstock collection location, odstock numbers, broodstock collection strategy, spawning and egg-take protocols?						
Does the hatchery program meet the requirements for he following?						
Species protocols (PM #4a)		✔			Review of records/Discussion	
Stock protocols (PM #4a)		✔			Review of records/Discussion	
Broodstock collection location protocols (PM #41b for existing program; PM #39b for new program)		✔			Review of records/Discussion	
Broodstock numbers protocols (PM #42c)		✔			Review of records/Discussion	
Broodstock collection strategy protocols (PM #41b-d for existing program; PM 39b-f for new program)				✔	Review of records/Discussion	See PM #41c
Spawning protocols (PM #42d-e)		✔			Review of records/Discussion	
Egg-take protocols (PM #42f-g)		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the hatchery's performance meet requirements						
ined in the regional hatchery policies and in basin and hatchery plans for the following areas: cent smoltification, rearing density, disease						
dition, and the number, size date(s), and location of ase?						
ercent smoltification (PM #22a1)			✔		No Smoltification goal	See PM #22a1
earing density (PM #22a2)		✔			Discussion	See PM #22a2
)isease condition (PM #22a3)		✔			Discussion	
Jumber at release (PM #22a4)				✔	Not enough fish	See PM #22a4
ize at release (PM #22a5)		✔			Discussion	
)ate of release (PM #22a6)		✔			Discussion	
ocation of release (PM #22a7)		✔			Discussion	
fish reared in the subbasin or acclimated in the basin? PM #22b		✔			Discussion	
ne release strategy appropriate for the program? PM #22c		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
new programs, has a broodstock collection plan n developed?						
s the broodstock collection plan written?		✔			Review of broodstock collection plan	
or a non-captive broodstock program:		✔				
Was an unbiased, representative sample collected?		✔			Discussion	
Was the recommended number of broodstock collected?				✔	Not enough fish available to meet goal	Improve adult returns
or a captive broodstock program:						
Were captive brood progeny excluded as donors for propagating the next generation of the captive broodstock program?	✔				Not a captive brood program	
Were full-sib crosses avoided?	✔				See above	
s the broodstock collection plan understood and being ollowed by staff?		✔				
a new program, was the donor selection outline owed in selecting the hatchery broodstock?						
s a donor selection plan written?		✔			Review of donor selection plan	
Was the donor selection outline followed in selecting ne broodstock?		✔			Discussion	
Was the target stock recommended in the donor election process actually used?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
existing programs, were the broodstock collection cedures followed?						
s the broodstock collection plan written?	✔				New program; does not apply	
Does the broodstock collection plan follow the uideline:					See above	
Was an unbiased, representative sample collected?	✔				See above	
Was the recommended number of broodstock collected?	✔				See above	
Were the broodstock collection procedures in hatchery operation plan understood and followed?	✔				See above	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the appropriate number of spawners, male/female os, and fertilization protocols used?						
ıre the spawning protocols written?		✔			See PM #39	
ıre daily or weekly spawning logs available?		✔			Review of records	
Vas the appropriate number of spawners used?		✔			Discussion	
)id you attempt to spawn all collected broodstock and ındomize mating with respect to age class, and other ·aits?		✔			Discussion	
Vas the sex-ratio within the limits given in the erformance standards?		✔			Discussion	
Vere the fertilization protocols followed?		✔			Discussion	
: the hatchery needed to reduce the number of eggs etained, was this done by representative sampling of ach male/female cross?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıere a genetics monitoring and evaluation program lace?						
; a genetics monitoring and evaluation program vailable?		✔			Review of plan	
)oes the plan address the following elements listed in HOT:						
Does the program have elements needed to meet evaluation goals 1-4?		✔			Discussion	
Has a qualified geneticist reviewed and endorsed the program (goal 5)?		✔			Discussion	
Will the program collect the data and maintain the records needed to evaluate compliance on an ongoing basis (goal 5)?		✔			Discussion	
Is the program understood and followed by staff?		✔			Discussion	

Section 4

Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions are organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control, to those that require a change in agency policy or procedures, to those that involve a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

The Five Types of Remedial Actions

Type	Description
1	Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery
2	Remedial actions requiring changes in agency policies or procedures
3	Remedial actions requiring changes in monitoring coverage or interval
4	Remedial actions requiring significant capital expenditures
5	Remedial actions that may require significant capital expenditures but are not clearly definable at this time

Remedial Actions at Methow Fish Hatchery - Spring Chinook (Twisp Stock)

This section presents the corrective actions required to bring the Methow Fish Hatchery - Spring Chinook (Twisp Stock) program into compliance with IHOT performance measures. The remedial actions suggested here are just that, suggestions developed by the Montgomery Watson Audit Team. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Table 3).

The cost estimates presented in this section are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented, and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates (± 40%).

More importantly, the suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.

Table 3. Remedial Actions Required at Methow Fish Hatchery - Spring Chinook (Twisp Stock)

Remedial Action Required	Cost	PMs[1]
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery		
Improve adult returns	----	4c, 4g, 22a2
Type 2 - Remedial actions requiring changes in agency policies or procedures		
Document smolt to adult survival	----	4h
Review IHOT temperature criteria for rearing	----	5a
Review IHOT disease-free criteria for rearing and acclimation	----	5h
Conduct IHOT QA/QC tests for feed preparation	----	12
Develop specific incubation standards for IHOT Operations Plan	----	18
Develop smoltification goals and monitor	----	22a1
Follow IHOT disinfection protocols for tank interiors	----	23
Follow IHOT protocols for disinfection of exteriors and interiors of transport vehicles	----	23
Follow IHOT standards for monitoring of oxygen concentration during transport	----	23
Install foot baths in incubation facilities	----	28
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Monitor DO and TGP	----	5b
Run analysis for missing water chemistry parameters, nitrite, and contaminants	----	5h

[1] PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Remedial Action Required	Cost	PMs[1]
Type 4 - Remedial actions requiring significant capital expenditures Install double screens on raceways	$1,200	10
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time Need 12 additional starter tanks, 5 more raceways, and 2 additional acclimation ponds for full program	$600,000	9, 19, 22a2

[1] PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Section 5

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Methow Fish Hatchery - Spring Chinook (Twisp Stock) program contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries. Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For some species, this may include fish caught as 2-, 3-, 4-, 5-, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4 to 5 years after the fish have been released from the hatchery.

Table 4. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries: Methow Fish Hatchery - Spring Chinook (Twisp Stock)

Year	Fisheries[1] (Broodyear)	Spawning Grounds[1] (Broodyear)	Hatchery[1] (Broodyear)	Total Combined Contribution[2] (Broodyear)	Smolt to Adult Survival (percent)
1982					
1983					
1984					
1985					
1986					
1987					
1988					
1989					
1990					
1991					
1992	Hatchery began operation in 1992; do not have complete broodyear data yet	Hatchery began operation in 1992; do not have complete broodyear data yet	Hatchery began operation in 1992; do not have complete broodyear data yet	Hatchery began operation in 1992; do not have complete broodyear data yet	Hatchery began operation in 1992; do not have complete broodyear data yet

[1] Data obtained from Missing Production Groups Annual Report or from the Regional Mark Information System database.

[2] Total combined adult contribution; presented when it is not possible to subdivide the contribution into Fisheries, spawning grounds, and hatchery contributions.

Section 6

Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged to the federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program was estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. Table 5 shows the annual operating expenses for the Methow Fish Hatchery - Spring Chinook (Twisp Stock) program. For programs that occur at more than one facility (as shown on Table 1 in Section 3 of this report), the cost breakdown for the component(s) at each facility is presented in separate tables (Table 5a).

Table 5. Annual Operating Expenses: Methow Fish Hatchery - Spring Chinook (Twisp Stock)

Hatchery	1994	1995	1996
1. Methow Hatchery	**$197,025**	**$0**	**$61,311**
2.			
3.			
4.			
5.			
Total Program Costs	**$197,025**	**$0**	**$61,311**

The total expenditures for the Methow Fish Hatchery are presented in Table 6 by program. The detailed breakdown of program expenditures at this hatchery are presented in separate tables (Tables 6a, 6b, and 6c).

Table 6. Annual Operating Expenses - Methow Fish Hatchery

Program	1994	1995	1996
1. Spring Chinook (Methow Stock)	**$39,405**	**$411,000**	**$164,031**
2. Spring Chinook (Twisp Stock)	**$197,025**	**$0**	**$61,311**
3. Spring Chinook (Chewuch Stock)	**$118,215**	**$0**	**$95,658**
4.			
5.			
Total Hatchery Costs	**$355,000**	**$411,000**	**$371,000**

Table 5a. Annual Operating Expenses: Methow Fish Hatchery - Spring Chinook (Twisp Stock)

Expenditure Occurring at Methow Hatchery

Component	1994	1995	1996
Personnel Costs	$192,000	$180,000	$171,000
Operational Costs	$102,000	$171,000	$96,000
Capital Costs	$23,000	$2,000	$2,000
Indirect Costs	$38,000	$58,000	$52,000
Lumped Hatchery Costs[1]			$50,000
Lumped Third-Party Costs			
Total Hatchery Costs	**$355,000**	**$411,000**	**$371,000**
Source of Funds			
Program Production (#)	20,000	0	90,000
Total Production (#)	36,000	14,000	470,000
Program as Percent of Total	55.5%	0%	19.1%
Program Costs	**$197,025**	**$0**	**$61,311**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 6a. Detailed Expenditures at Methow Fish Hatchery by Program

Spring Chinook (Methow Stock)

Component	1994	1995	1996
Personnel Costs	$192,000	$180,000	$171,000
Operational Costs	$102,000	$171,000	$96,000
Capital Costs	$23,000	$2,000	$2,000
Indirect Costs	$38,000	$58,000	$52,000
Lumped Hatchery Costs[1]			$50,000
Lumped Third-Party Costs			
Total Hatchery Costs	**$355,000**	**$411,000**	**$371,000**
Source of Funds			
Program Production (lb)	4,000	14,000	240,000
Total Production (lb)	36,000	14,000	470,000
Program as Percent of Total	11.1%	100%	51.1%
Program Costs	**$39,405**	**$411,000**	**$164,031**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 6b. Detailed Expenditures at Methow Fish Hatchery by Program

Spring Chinook (Twisp Stock)

Component	1994	1995	1996
Personnel Costs	$192,000	$180,000	$171,000
Operational Costs	$102,000	$171,000	$96,000
Capital Costs	$23,000	$2,000	$2,000
Indirect Costs	$38,000	$58,000	$52,000
Lumped Hatchery Costs[1]			$50,000
Lumped Third-Party Costs			
Total Hatchery Costs	**$355,000**	**$411,000**	**$371,000**
Source of Funds			
Program Production (lb)	20,000	0	90,000
Total Production (lb)	36,000	14,000	470,000
Program as Percent of Total	55.5%	0%	19.1%
Program Costs	**$197,025**	**$0**	**$61,311**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 6c. Detailed Expenditures at Methow Fish Hatchery by Program

Spring Chinook (Chewuch Stock)

Component	1994	1995	1996
Personnel Costs	$192,000	$180,000	$171,000
Operational Costs	$102,000	$171,000	$96,000
Capital Costs	$23,000	$2,000	$2,000
Indirect Costs	$38,000	$58,000	$52,000
Lumped Hatchery Costs[1]			$50,000
Lumped Third-Party Costs			
Total Hatchery Costs	**$355,000**	**$411,000**	**$371,000**
Source of Funds			
Program Production (lb)	12,000	0	140,000
Total Production (lb)	36,000	14,000	470,000
Program as Percent of Total	33.3%	0%	29.8%
Program Costs	**$118,215**	**$0**	**$95,658**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.